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Energy access indicators and trends in Ghana

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ABSTRACT

Providing access to modern energy services for development is a daunting task which requires rigorous planning based on robust information. Energy access indicators enable measurement and monitoring of the progress of energy access expansion efforts, thus informing corrective efforts and efforts worth replicating. This paper reviews what has been proposed to constitute energy access and energy access indicators. The paper further reviews briefly the different types of energy access indicators and analyses access to modern energy in Ghana as measured using the energy access indicators employed in Ghana. The paper concludes that Ghana has achieved commendable access to modern energy services compared to her sub-Saharan peers but recommends further efforts to achieve the set targets of universal access to electricity by 2020 and 50% access to LPG by 2020. The paper finally recommends further work on the different types of indicators which are relevant for tracking energy access progress but are not currently employed in the country.

Contents

1. Introduction . . . 317
2. Definitions of energy access and indicators in Ghana . . . 318
   2.1. Energy access, what is it? . . . 318
   2.2. Energy access indicators . . . 318
      2.2.1. Multidimensional Energy Poverty Index (MEPI). . . . 318
      2.2.2. The Energy Development Index (EDI). . . . 319
      2.2.3. Energy access index. . . . 319
3. Electricity access in Ghana . . . 319
4. LPG access in Ghana . . . 320
5. Issues and priorities . . . 322
6. Conclusions and recommendations . . . 323
References . . . 323

1. Introduction

The Sustainable Energy for All (SE4All) Initiative which was launched by the UN Secretary General has an overarching objective of ensuring universal access to sustainable energy by 2030 [1]. SE4All is designed to reach out to the over 1.3 billion people who have no access to electricity and another 2.7 billion people who still cook with traditional biomass such as dung and wood and other plant/crop residue, with a majority of these people in Developing Asia and Sub-Saharan Africa [1–3]. The initiative has three specific objectives of ensuring universal access to modern energy services, doubling the rate of improvement in energy efficiency and doubling the renewable energy share in the global energy mix by 2030 [1]. Ghana with support from the United Nations Development Programme (UNDP) is the first country to develop a SE4All country action plan with a focus on access to clean cooking fuels and modern energy services for productive uses.

Even before the SE4All Initiative the Government of Ghana had committed itself to a target of 50% access to LPG by 2015. The Government had also committed itself to the National Electrification

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Programme (NEP) which is aimed at achieving universal access to electricity by 2020, ten years ahead of the SE4All initiative. Achieving these targets is a challenge that requires strong political and financial commitment, rigorous planning, tailor-made institutions and adequate policies.

In addition, effective monitoring and measurement of energy access programmes enhance access provision as the results of these exercises aid in tracking the progress of energy access initiatives; diagnosing failures and/or challenges of access programmes, leading to remedial strategies; and identifying functioning policies for replica tion [4]. In order to measure energy access in ways that inform improvement and decision making, there should exist indicators that clearly portray the progress being made on all fronts. There are different types of energy access indicators and this paper focuses on those used in Ghana and the access picture these indicators paint of Ghana. Section two of the paper reviews the different types of energy access indicators and what constitutes energy access. Section three reviews electricity access in Ghana and section four reviews access to LPG. This is followed in section five with issues and priorities while conclusions and recommendations are presented in section six.

2. Definitions of energy access and indicators in Ghana

2.1. Energy access, what is it?

Although access to modern energy services has always been mentioned as being a prerequisite for development, the year 2012 saw the agenda becoming more conspicuous with the launch of the SE4All initiative by the UN Secretary General. So what constitutes access to modern energy services? Is it the presence of electricity in a community, or the presence of an LPG station? The definition of energy access is one that is highly contentious and there is no one universal definition. Some definitions include access to modern cooking fuels and minimum electricity for lighting and reading at night [5]. Access to electricity has also been defined as the availability of electricity in areas reached by the grid or other off-grid electricity solutions. In the case of off-grid solutions, electricity is provided by a decentralized or stand-alone power source (petrol or diesel generator), or renewable energy device (solar PV, wind turbine or biomass gasifier) [6]. The International Energy Agency defines energy access as "a household having reliable and affordable access to clean cooking facilities, a first connection to electricity and then an increasing level of electricity consumption over time to reach the regional average" [7]. One of the weaknesses associated with these definitions is their failure to account for energy access for economic activities which is critical for development, the driver of access provision. Other efforts have also been made to define energy poverty (lack of energy access) by entities such as Practical Action and UNDP [8]. Furthermore, whether defining energy access or energy poverty, one cannot lose sight of the fact that most of these definitions may be based on assumptions and thus subjective, and may fail to take cultural practices into consideration [8].

In Ghana, access to modern energy services is defined as the communities/households connected to the grid (i.e. electricity access) and the number of households using LPG either as their main fuel for cooking or in combination with other cooking fuels (i.e. access to clean cooking fuels). Work is on-going within the country to take cognizance of the energy access for productive and communal purposes but this is still at the research stage.

2.2. Energy access indicators

Once what constitutes access to modern energy has been defined, the need for indicators to measure modern energy access or energy poverty becomes critical.

Energy Access Indicators are the quantitative and/or qualitative measures derived from a series of observed facts that can reveal a country, community or person's relative status in modern energy access [9]. They simplify, clarify and make aggregated information available to relevant stakeholders to aid in drawing attention to issues and setting policy priorities. They also help to establish trends over time [9–11], which facilitates projections and planning for energy access. Energy access indicators can be single (one-dimensional), a set of individual non-aggregated indicators (dashboards), or composite in nature [8,12]. Both dashboards and composite indicators are multidimensional.

One-dimensional indicators measure the performance of energy access from a single aspect of the issue. Although these are straightforward, easy to interpret and send clear messages, they tend to give a narrow perspective of the issue [8]. Examples include electricity consumption per capita and number/percentage of population with electricity access. The 'dashboards', which are a collection of single indicators developed to address an issue from different angles, seek to correct the weakness of the one-dimensional indicators thus allowing a more holistic evaluation. However, it is not an easy feat measuring and tracking these respective indicators, or even communicating them to stakeholders [8]. Composite indicators have been created to provide an intersection between one-dimensional indicators and dashboards in order to account for the multidimensional nature of issues such as energy access, sustainability and the like. A composite indicator is produced by condensing many different single indicators that address the multidimensionality of energy access into a single index based on a model [9]. Examples of composite indicators are the Multidimensional Energy Poverty Index (MEPI) developed by a team at UNIDO, the Energy Development Index (EDI) used by the International Energy Agency and the Energy Access Index proposed by the UK Charity, Practical Action.

Bazilian et al. [12] argue that the subject of quantity and quality of energy access should be seen to reflect in the metrics used for energy access. This goes to buttress the need for indicators that reflect the multidimensionality of energy access indicators. In addition, Hailu [11] agrees with Bazilian et al. [12] that in developing indicators, issues such as their political acceptability and simplicity of use, comparability, theoretical correctness and statistical strength as well as availability of data should receive careful consideration since they will serve as/form part of decision support tools to aid in planning for energy access. The next subsections review briefly three of these multidimensional EAIs namely; MEPI, EDI and the Energy Access Index.

2.2.1. Multidimensional Energy Poverty Index (MEPI)

The Multidimensional Energy Poverty Index (MEPI) is a composite indicator that measures energy deprivation as opposed to other EAIs that focus on measuring the availability of modern energy services. It takes into account the occurrence and magnitude of energy poverty. It captures six dimensions of energy poverty (Table 1) and an individual is energy poor if "the combination of the deprivations faced exceeds a pre-defined threshold" [8]. The MEPI score is calculated as the product of a headcount ratio (share of people identified as energy poor) and the average intensity of deprivation of the energy poor. There is a total score of 1.0 and the higher the score for a country, the higher the intensity of energy poverty. MEPI scores for sub-Saharan African countries, ranging from 0.53 for Namibia and Senegal to 0.9 for Ethiopia, are a clear indication that energy poverty is prevalent in Sub-Saharan Africa. Barring all criticisms of the tool including the issue of weighting, this information can be used to design robust policies to remedy the situation.

Table 1
Dimensions and respective variables with cut-offs, including relative weights (in parenthesis).
Source [8].

Dimension	Indicator *(weight)*	Variable	Deprivation cut-off (Poor if…)
Cooking	Modern cooking fuel *(0.2)*	Type of cooking fuel	Use any fuel beside electricity, LPG, kerosene, natural gas, or biogas
	Indoor pollution *(0.2)*	Food cooked on stove or open fire (no hood/chimney) if using any fuel beside electricity, LPG, natural gas, or biogas	True
Lighting	Electricity access *(0.2)*	Has access to electricity	False
Services provided by means of household	Household appliance ownership (0.13)	Has a fridge	False
Entertainment/education	Entertainment/education appliance ownership (0.13)	Has a radio OR television	False
Communication	Telecommunication means (0.13)	Has a phone land line OR a mobile phone	False

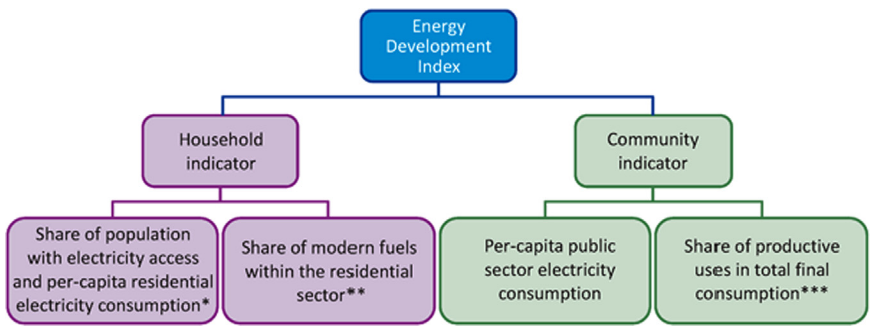


Fig. 1. Components of the Energy Development Index.
Source: [13].

2.2.2. The Energy Development Index (EDI)

The Energy Development Index is an indicator which presents the level of energy access of countries. It was developed by the International Energy Agency (IEA) and its results are presented in the annual World Energy Outlook (WEO) report by the same agency [13]. This indicator distinguishes between energy development at the household and community levels and is intended to make clear the role of energy in human development. The EDI is also a composite index with a total maximum score of 1.0. A country's EDI score is an aggregation of the individual indicators in Fig. 1, i.e. electricity indicator, clean cooking indicator, public services indicator and productive use indicator.

2.2.3. Energy access index

The Energy Access Index was developed by Practical Action and prescribes a minimum level of service for six essential categories of energy services under three main dimensions namely household fuels, electricity and mechanical power shown in Table 2. It assigns values to the different dimensions where 1 is the lowest and 5 is the highest level of access [14]. The index can be used at the individual, household and community level. The Energy Access Index, unlike the MEPI and EDI, does not aggregate overall energy access position into a single indicator. Rather, a composite view of the relative energy access experience in the three defined energy supply dimensions for a household, village or country is provided using the proportion of the population at each level of access [14].

Presently in Ghana, only one-dimensional energy access indicators are used to quantify energy access for households and communities. This paper therefore reviews the trends in access to modern energy services in Ghana using the one-dimensional indicators (i.e. number of communities/households connected to the grid and number of households using LPG). The paper recommends the adoption of an appropriate multi-dimensional energy access indicator for future access measurements which is more robust and presents a clearer picture of the energy access level in the country.

3. Electricity access in Ghana

The aim of the government of Ghana is to achieve universal access to electricity by the year 2020 and the original intention was to connect all communities with a population of 500 and above to the grid. As shown in Fig. 2, a number of institutions in Ghana have conducted surveys to estimate electricity access in the country to estimate how far the government has come towards realizing the universal access target. The Ghana Statistical Services (GSS) conducts periodic national population and housing census (PHC) and towards the end of 2010, a PHC was conducted which established the electricity access as 64.2%. Earlier that same year, the Energy Commission (EC) also conducted a national electricity access survey as part of a wider energy access survey to determine access to various forms of energy in the country. According to the EC survey, the national household access to electricity in 2010 was 60.4%.

The Ministry of Energy (MoEN) also established in 2010 following a national mapping of communities with and without electricity, that access to electricity, using total population in communities that had access to the grid, stood at 72.8%. Again in 2010, The Energy Center of Kwame Nkrumah University of Science and Technology (TEC) conducted a survey of 3 peri-urban slums in the Ashanti and Greater Accra regions with funding from the Energy Sector Management Assistance Program (ESMAP) of the World Bank. The survey was part of a scoping study meant to examine the pro-poor energy policies in relation to the slums'

Table 2
Energy Access Index proposed by Practical Action.
Source [14].

Energy supply	Level	Quality of supply
Household fuels	1	Collecting wood or dung and using a three-stone fire
	2	Collecting wood and using an improved stove
	3	Buying wood and using an improved stove
	4	Buying charcoal and using an improved stove
	5	Using a modern, clean-burning fuel and stove combination
Electricity	1	No access to electricity at all
	2	Access to third party battery charging only
	3	Own low-voltage DC access for home applications
	4	240 V AC connection but poor quality and intermittent supply
	5	Reliable 240 V AC connection available for all uses
Mechanical power	1	No access to mechanical power. Hand power only with basic tools
	2	Mechanical advantage devices available to magnify human/ animal effort
	3	Powered (renewable or fossil) mechanical devices available for some tasks
	4	Powered (renewable or fossil) mechanical devices available for most tasks
	5	Mainly purchasing mechanically processed services

access to energy and provide an insight into the challenges confronting the slum dwellers. The survey showed a high electricity access rate in the 3 slums, at 88.2%. In 2011, TEC conducted a second survey, this time in three (3) regions in the country with the purpose of generating data for energy scenarios and modeling purposes; this TEC survey recorded an electricity access rate of 84.7% for the three regions.

Over the years, in addition to the PHC, the GSS has also recorded periodic access figures from the Ghana Living Standards Survey (GLSS). Based on electricity access figures from the PHC and GLSS shown on curve DF in Fig. 2, it is estimated that Ghana could be on its way to achieving universal access to electricity by 2023 in a business-as-usual scenario,[2] shown by the projection in EF, which is three years later than the planned date of 2020. However, historical electricity access curves presented in the Global Energy Assessment [15] indicate that there is a tailing off as a country approaches universal access which would imply that even under the business-as-usual scenario the end point could be much later than 2023.

Recent pronouncements by the Government, including a presentation made on behalf of the President, indicate a desire to achieve universal access to electricity by 2016 [16]. Scenario A suggests that this can be achieved based on the community-based definition for electricity access employed by the Ministry of Energy, given that the slope (rate of increase) is similar to that of the business-as-usual trendline. However, Scenario B suggests that a major shift in the trajectory would be required if one uses the household-based definition for energy access and it is unlikely that universal access by 2016 will be achieved, tailing-off considerations included, unless some very drastic measures are introduced immediately. Scenario C appears to be the more plausible of the two trajectories using the household-based definition for access to electricity. Needless to say, even in this case a significant change would be required away from the business-as-usual trendline.

One of the greatest challenges to achieving full electrification is the dichotomy between rural and urban areas. The 2010 PHC indicates that 84% of urban households have access to electricity whereas only 40% of rural households have access. For most unconnected urban households in Ghana, not having connection to grid electricity owes more to financial constraints than a lack of access to the grid infrastructure. This is because the electricity grid passes through every urban community in Ghana (defined as communities with a minimum population of 5000). A challenge to achieving full national electrification is therefore dependent on the extension of the grid or other appropriate electrification technology forms to rural communities. The remoteness of some rural communities could also present a challenge to achieving universal electrification by the proposed date and may call for a blend of electrification technologies. Such electrification technologies should include off-grid and mini-grid solutions using renewables and other resources such as solar, wind and mini-hydro. For some communities, alternative forms of electrification may well turn out to be cheaper than extending the grid or may serve as stop-gap solutions, especially where there are low possibilities of productive uses in the short to medium term.

Another great electricity access challenge that confronts Ghana is that more than 50% of the presently ‘unconnected’ population in the country would still be living in communities smaller than 500 by the year 2020 (See Fig. 3). The majority of these communities are unlikely to be connected to the grid using the current electrification criteria. Fig. 3 gives an indication of the total population of these communities in 2020. It shows that by 2020, about 3.2 million people may not be connected to the electricity grid based on Ghana's current criteria for connecting communities to the grid because they would have a population less than 500. Experience has shown, however, that some of these communities get connected to the grid if medium voltage lines ‘pass through’ them on the way to connecting larger neighboring communities or through other discrete electrification projects. However, there are no data to assess the extent to which this has happened and how it could affect remaining un-electrified communities. A timely provision of data is important to assist with planning and to determine the extent to which communities with population below 500 are benefiting from the grid extension program.

4. LPG access in Ghana

Ghana has over the years made efforts to improve its cooking fuels situation but unlike electricity access which has experienced

[2] Business-as-usual scenario assumes that the trendline follows access figures from the PHC and GLSS which were obtained by the Ghana Statistical Services. There is a high correlation between the access figures as shown in Fig. 1.

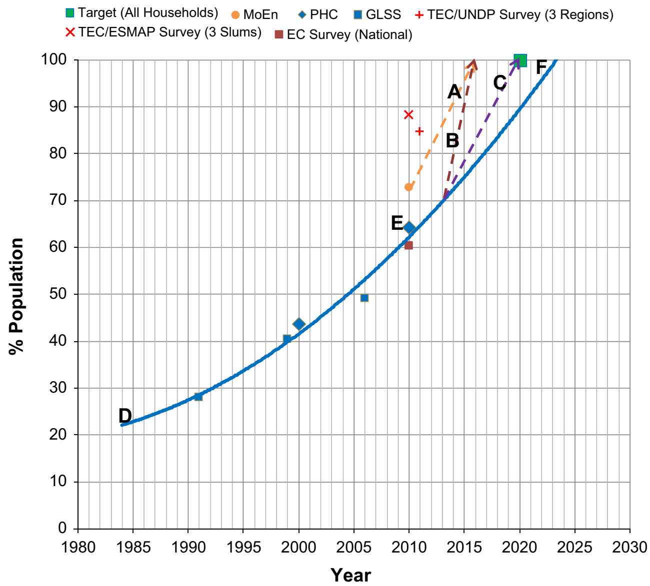


Fig. 2. Electricity access trends in Ghana from various surveys and projection to universal access target.

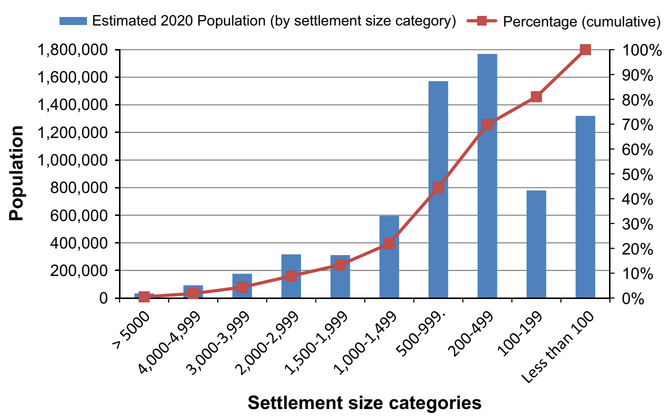


Fig. 3. Estimated 2020 Population of presently un-electrified communities (by settlement size category).

significant growth in the last couple of decades, growth in access to LPG has been rather modest. The Government of Ghana in 1989 embarked on a major LPG promotion exercise, which raised the percentage of households using LPG as main fuel for cooking from less than 2 to 9.5% in 2008. LPG is particularly used in the urban areas for domestic and commercial heating and cooking. Demand for LPG in the industrial and transportation sectors has also increased significantly in recent times.

Ghana currently employs the LPG retail filling-stations model where consumers own their bottles and commute to purchase LPG from retail filling-stations. This model requires that consumers commute to the nearest retail station to access LPG. It is not unusual to see long queues at LPG retail filling-stations in the country which tend to reduce interest in using LPG and results in low access figures. The low access to LPG at the household level is worse in the Northern part of the country (shown as Northern, Upper East and Upper West regions in Fig. 4) where LPG access is extremely low. For instance, as at 2011, there was one LPG station per 51,444 people in the Greater Accra region which is almost ten times less in size than the Northern region where a population of 411,426 are served by one LPG station (see Fig. 5). Although the number of LPG stations across Ghana is inadequate, the situation in the three Northern regions is very bleak as the LPG stations are

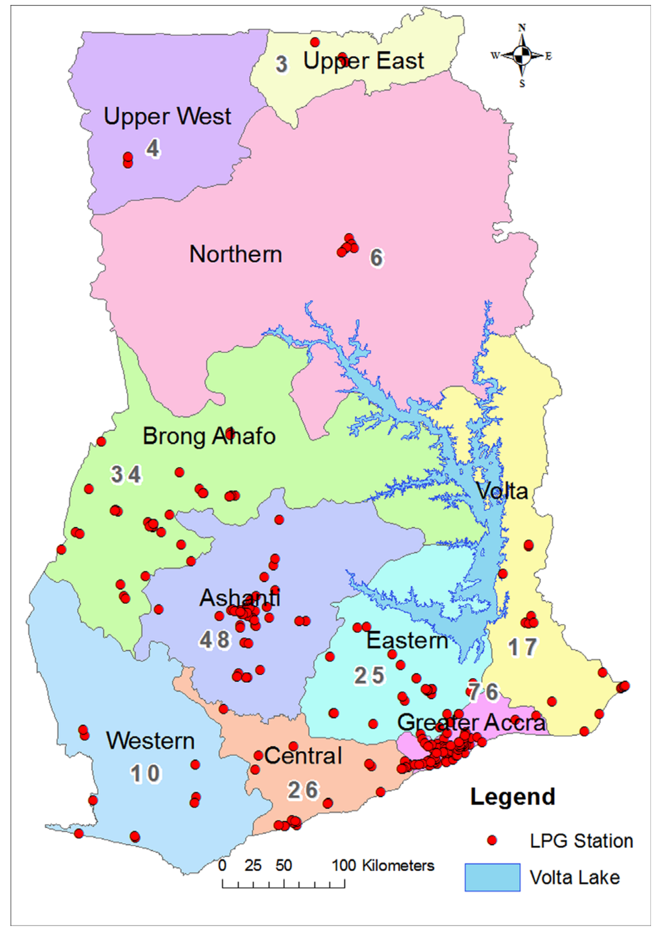


Fig. 4. A map of Ghana indicating location of LPG retail stations.

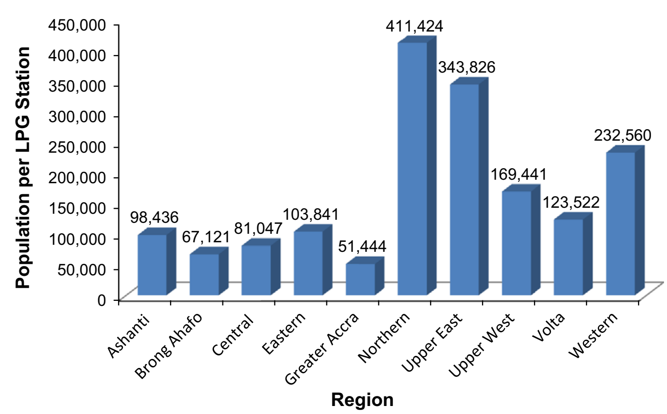


Fig. 5. Population per LPG Retail Station in Ghana, 2010.

also concentrated in just the regional capitals. The difficulty of access to LPG by remote settlements in Northern Ghana is partly due to the low population density of the region coupled with persistent transportation problems – posing challenges to both suppliers and retailers alike. The remaining regions in the Southern parts of the country are better served than the Northern parts but also lag behind the Greater Accra Region which, as the region housing the nation's capital, benefits from improved infrastructure. Generally, the number of retail filling-stations are inadequate, a situation that must be urgently addressed to improve access to LPG.

The Ministry of Energy in 2010 outlined an Energy Policy and Energy Sector Strategy with a key policy objective to increase LPG

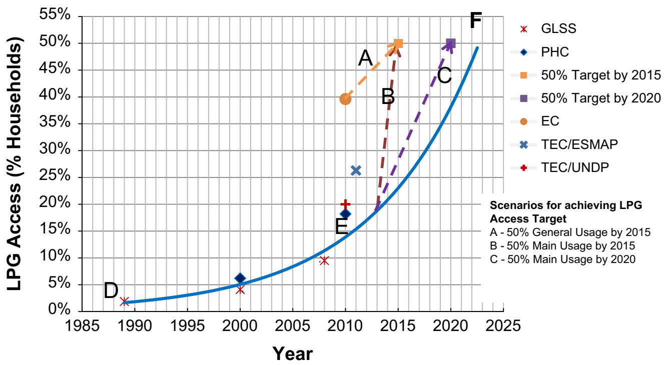


Fig. 6. LPG access trends in Ghana from various surveys and projections to a 50% target.

access to households and public institutions from 9.5% in 2008 to at least 50% by 2015. Fig. 6 shows LPG access rates from the same surveys and censuses described in Fig. 2. Fig. 6 also shows various scenarios for achieving the 50% target all premised on the expectation that LPG would be available, either from imports or domestic production including the processing of Ghana's own natural gas. The GSS and TEC measured LPG access in terms of "main usage" (where LPG is the main coking fuel in a household) while EC considered "general usage" (where LPG is used in a household, irrespective of frequency). Thus, projections using the GSS data from 1989 to 2010 on a business as usual scenario[3] show that only 40% of households in Ghana would be using LPG as their main source of cooking fuel by 2020 with the 50% target being achieved closer to 2023, eight years later than the projected timeline. Nevertheless, Scenario A in Fig. 6 suggests that the 50% access target can be achieved by 2015 on the basis of general usage, as measured by EC, such that 50% households can be expected to use LPG for cooking, irrespective of frequency of use. This assertion that 50% LPG access (general usage) by 2015 can be achieved is based on the fact that the trend line for Scenario A has a gentler slope (lower rate of increase) than the business-as-usual curve using the GSS data.

The challenge for Ghana will be to achieve the 50% LPG access target on the basis of main usage, as depicted in Scenarios B and C in Fig. 6. Based upon the required changes in trajectories, one can say that Scenario C (50% main usage by 2020) is more likely to be achieved than Scenario B (50% main usage by 2015) so that a more realistic target for LPG access in Ghana in terms of the households using LPG as the main source of fuel for cooking would be 50% by 2020. Here too, even Scenario C would require a significant shift to achieve a higher rate of increase than in the business-as-usual case. Achieving the higher rate of increase makes it imperative that current bottlenecks in the supply chain for LPG are addressed using all the instruments and measures at the disposal of energy policy makers in the country.

5. Issues and priorities

Compared to most Sub-Saharan African countries, Ghana is doing well in providing access to modern energy services to her citizens. Figs. 2 and 6 described above and summarized in Table 3 portray the nation's progress and scenarios for the future. Going forward, a lot more needs to be done, especially in the area of LPG or other clean cooking fuels. The 2010 PHC results show that as high as 75% of the population use some kind of biomass for cooking while a mere 18% use LPG. The implications for indoor pollution and its associated health risks, deforestation and many other negative impacts cannot be overemphasized. It is for this reason that the SE4All action plan has made the promotion of clean cooking fuels a priority objective.

It was observed in Fig. 6 that the 50% target of LPG usage as the main cooking fuel by 2015 may not be achievable and that 2020 could be a more realistic timeline even with doubled efforts. Whether 2015 or 2020, the fact still remains that constructive and tangible measures must be put in place to achieve that target. It was expected that domestic supply of LPG produced from Ghana's own natural gas would be available and sufficient to meet demand by 2013. However, delays in completion of the gas processing plant would have negative implications for domestic LPG supply unless alternative options are implemented in a timely manner.

The other side of the LPG access coin is that there are not enough LPG filling stations in the country and the existing stations are unevenly distributed across the nation with the three northern regions being the most deprived. Consumers who can afford the use of LPG are forced to use other alternative fuels when they cannot access the product due to unavailability of filling stations. There have also been major shortages of LPG partly as a result of increased use in commercial vehicles seeking to take advantage of the LPG subsidy. A policy recommendation has been made to the Government by the Energy Commission for Ghana to shift from a retail filling-stations model where consumers own their bottles to one where there are centralized filling-depots with the bottles re-circulated and possibly owned by the LPG marketing companies. Another policy recommendation has been made to the Government to deal with the issue of competition from commercial vehicles by redirecting the LPG subsidy to end-use equipment for domestic consumers. Implementing these recommendations could remove some of the most critical bottlenecks in Ghana's LPG supply chain and put the country on track to achieve its ambitious targets for access to clean cooking fuels in households.

At 64% household access to electricity, Ghana needs to do more to ensure universal access by the set timeline of 2020, or earlier. Other options for rural electrification, notably mini-grid and off-grid renewable, should be incorporated into the NES and funding schemes should be established to facilitate the entry of Small and Medium Enterprises (SMEs) into the rural electrification market. Hitherto, rural populations have been less than enthusiastic about these mini/off-grid options partly because of the quantity and quality of electricity they deliver and partly also because these options do not allow them to benefit from the same levels of subsidies enjoyed by those with grid-electricity [17,18]. Subsidies on electricity in general have been a major bone of contention between the regulator and the power companies with full cost recovery and cross-subsidization between different categories of consumers seen as the solution.

Ghana frequently experiences load shedding, a phenomenon which is locally referred to as "dumso-dumso" (on & off). The load shedding is principally due to inadequate generation capacity arising from shortage of natural gas from the West Africa Gas Pipeline and other issues to do with plant maintenance. This has not only affected households' reliability of electricity supply but also increased the cost of industrial activities as most industries have had to rely on standby generators powered by diesel. This brings into sharp focus other dimensions of the electrification challenge such as quality and reliability of supply. For Ghana to achieve her laudable electricity access targets, the supply-side issues will have to be addressed head-on. For instance, private operators seeking to enter the generation market as Independent Power Producers (IPPs) have difficulty obtaining Power Purchase Agreements (PPAs) from the distribution companies. One recommendation that has been put to the Government is to establish a

[3] Business-as-usual scenario assumes that the trendline follows access figures from the PHC and GLSS which were obtained by the Ghana Statistical Services. Again, there is a high correlation between the access figures as shown in Fig. 6.

Table 3
Various scenarios and assumptions to reach targeted levels of electricity and LPG.

Scenario – assumptions	Likely achievable year
Electricity	
100% household access – business as usual	2023
100% household access to electricity – minor shift in trajectory	2020
100% household access – major shift in trajectory	2016
100% community access – Business as usual for communities with minimum population of 500	2016
LPG	
50% access to LPG – business as usual	2023
40% access to LPG – business as usual	2020
50% access to LPG – major shift in trajectory	2020

power trading company licensed to sign PPAs with the IPPs to make sure that Ghana gets the power that it needs with assistance from the private sector.

Another challenge that Ghana is facing in its electrification drive is the fact that most consumers use electricity for social purposes, highlighting the issue of energy for productive uses. Also, the indicators used and definition of access tends to dwell on households and seems to neglect productive uses which are critical for development. The nation's SE4All country action plan has made productive uses of energy a priority and it is hoped that implementation of the plan will lead to tangible benefits for all.

6. Conclusions and recommendations

Ghana has made significant strides in electricity access due to long-range energy planning with clear targets, availability of external funding, political/popular demand and active role of central government in the implementation of energy policies. In the case of access to electricity in households, Ghana has gone from 28% in 1989 to 64% in 2010. Access to LPG as main fuel used for cooking in households has also gone from less than 2% in 1989 to 18% in 2010. However a lot more needs to be done to achieve universal access to electricity and 50% access to LPG as main fuel for cooking, in households, by 2020. Three sets of issues will need to be addressed to make these ambitious targets achievable: supply-side reliability, effective business models and judicious use of subsidies. Both electricity and LPG suffer major supply constraints in Ghana and suggestions made to address these include establishment of a power trading company to facilitate entry of IPPs and expediting action on completion of a gas processing plant to produce LPG from Ghana's own natural gas resources. In the area of business models the reliance on utility-based grid electrification and the distributed filling-station approach have served Ghana reasonably well up till now; going forward, new business models like SME-based mini-grids and off-grids with respect to electricity and cylinder recirculation with centralized filling-depots have been proposed. The problem of subsidies, be they direct subsidies from the Government or cross-subsidies among different products or categories of consumers, will need to be resolved and suggestions put forward include a focus on cross-subsidies and a redirection of LPG subsidies from the fuel to end-use equipment.

Measuring and monitoring the progress of energy access programmes and how they impact on the broader development process would be useful for economy-wide planning, policy design and improvements. Although the one dimensional indicators used in Ghana are helpful for tracking achievement of the targets set by the Government, they are not enough to provide a holistic view of socio-economic development in the country. It is therefore recommended that further work be carried out on developing a multidimensional indicator or adopting, and if need be adapting, an existing one for Ghana to help provide a necessary tool for facilitating more development-oriented energy access programmes.

If the UN Secretary General's SE4All Initiative is to succeed, it will have to take on board some of the lessons coming out of Ghana's experiences with energy access. The importance of long-range energy planning with clear targets, external funding, and political/popular support cannot be over-emphasized. Policy analysis at national and regional levels to address country-specific challenges that arise in the course of implementation should also not be downplayed. Ultimately, it is the diligent collection and well-defined use of energy access indicators to inform policy makers and the general populace on how well they are doing as a country or region that will help engender the will to succeed; no effort should therefore be spared in building the requisite capacity for this all-important endeavor.

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